
Rapid and cost-effective gene targeting in rat embryonic stem cells by TALENs.

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Public Summary:

The rat is the preferred animal model in many human health-related research fields. The availability of rat embryonic stem (ES) cells has enabled the creation of rat models with a variety of genetic modification. Previously, we generated a knockout rat via conventional homologous recombination in rat ES cells. Here, we show that efficient gene targeting in rat ES cells can be achieved quickly through transcription activator-like effector nuclease (TALEN)-mediated DNA double-strand breaks. Our results suggest that TALEN-mediated gene targeting is a superior means of establishing genetically modified rat ES cell lines with high efficiency and short turnaround time.

Scientific Abstract:

The rat is the preferred animal model in many areas of biomedical research and drug development. Genetic manipulation in rats has lagged behind that in mice due to the lack of efficient gene targeting tools. Previously, we generated a knockout rat via conventional homologous recombination in rat embryonic stem (ES) cells. Here, we show that efficient gene targeting in rat ES cells can be achieved quickly through transcription activator-like effector nuclease (TALEN)-mediated DNA double-strand breaks. Using the Golden Gate cloning technique, we constructed a pair of TALEN targeting vectors for the gene of interest in 5 days. After gene transfection, the targeted rat ES cell colonies were isolated, screened, and confirmed by PCR without the need of drug selection. Our results suggest that TALEN-mediated gene targeting is a superior means of establishing genetically modified rat ES cell lines with high efficiency and short turnaround time.

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